



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029

April 19, 2006

Mr. Barry Buchanan  
Environmental/Engineering Specialist  
Duke Energy Virginia Pipeline Company  
1096 Ole Berry Drive  
Abingdon, VA 24210

Dear Mr. Buchanan:

EPA Region III Underground Injection Control (UIC) Program staff have completed their review of your completion reports and attachments, submitted under EPA UIC permit VAS3G931BSMY, for the following injection wells:

**Injection wells 13b and 14a at the Saltville Gas Storage Project**

These completion reports are acceptable and this letter formally authorizes you to commence injection into these wells in accordance with the conditions stipulated in your permit. A verbal authorization to commence injection into these wells was provided by a telephone call to you on April 19, 2006.

If you should have any questions, please give Stephen Platt of my staff a call at 215-814-5464.

Sincerely,

A handwritten signature in cursive script, appearing to read "Karen D. Johnson", is written above the typed name.

Karen D. Johnson, Chief  
SDWA Branch (3WP32)  
Office of Compliance and Enforcement





11757 Katy Freeway, Suite 600  
Houston, Texas 77079

(281) 496-5590  
Fax (281) 496-5865  
www.pbenergy.com

March 9, 2006

Mr. Scott Hill  
Virginia Gas Company/Duke Energy  
1096 Ole Berry Dr.  
Abingdon, Va 24210

Re: Mechanical Integrity Test Results for Saltville Brine Wells CH-13B and CH-14A

Dear Mr. Hill:

PB Energy Storage Services, Inc. (PB ESS) has completed processing the Mechanical Integrity Tests (MIT) data for Saltville Brine Wells CH-13B and CH-14A. The wells were tested using the EPA water/brine interface method modified for diesel/brine interface. The following documents are attached:

- Mechanical Integrity Test Data for Well CH-13B – Test Sheet and Pressure Graph
- Mechanical Integrity Test Data for Well CH-14A – Test Sheet and Pressure Graph
- EPA approved MIT procedure used for the MIT, with well schematics for each well.

#### TEST CHRONOLOGY

Virginia Gas pressured the two-well cavern gallery by injecting brine into Well CH-14A. Brine injection was started on February 21, 2006 and ended on February 23, 2006 with the Well CH-14A wellhead pressure at approximately 385 psig (by gauge). Well CH-13B wellhead pressure was approximately 360 psig (by gauge). The wells were shut in and the cavern was allowed to stabilize.

PB ESS installed digital recorders on each of the wells to read both 9-5/8"x4-1/2" annulus and 4-1/2" tubing pressures. Well Test Solutions SDS Series 3000 digital pressure recorders were used. These recorders are capable of measuring pressures to .001 psi with an accuracy of 0.024% FS and a pressure resolution of 0.0003% FS. Data sampling rates were set at 5 minute intervals. On February 27, 2006, 96 bbls of diesel was injected into the annulus of Well CH-14A and 95 bbls was injected into the annulus of Well CH-13B. These injected diesel volumes placed the diesel/brine interface below the casing shoe of each well. (Refer to MIT procedure well schematics). The wells were then shut in and allowed to stabilize. Virginia Gas downloaded the digital data daily and e-mailed the files to PB ESS for analysis. Analysis of pressure data for March 3, 2006 indicated a successful 8-hour test for both wells.

#### TEST RESULTS

The EPA procedure specifies that a well demonstrates mechanical integrity when the Net Pressure Change Rate (NPCR) is below 0.05 psi/hr over an 8-hour period. The following are the NPCR calculations for each well, derived from the attached test data sheets.

##### WELL CH-13B

$$P_{Start} = P_{StartTestWell} - P_{StartReflowWell}$$

$$P_{Start} = 617.88 \text{ psig} - 375.712 \text{ psig}$$

$$P_{Start} = 242.168 \text{ psi}$$

$$NPCR = \frac{(P_{Start} - P_{End})}{TestLength}$$

$$8\text{-HOUR TEST NPCR} = -0.003 \text{ psi / hour}$$

$$Test Gradient = 0.749 \text{ psi/ft to 9-5/8" production casing shoe @ 1621'}$$

$$P_{End} = P_{EndTestWell} - P_{EndReflowWell}$$

$$P_{End} = 617.435 \text{ psig} - 375.241 \text{ psig}$$

$$P_{End} = 242.194 \text{ psi}$$

$$NPCR = \frac{(242.168 \text{ psi} - 242.194 \text{ psi})}{8 \text{ hours}}$$

A Parsons Brinckerhoff Company

**WELL CH-14A**

$$P_{Start} = P_{StartTestWell} - P_{StartRefWell}$$

$$P_{Start} = 615.408 \text{ psig} - 387.69 \text{ psig}$$

$$P_{Start} = 227.718 \text{ psi}$$

$$NPCR = \frac{(P_{Start} - P_{End})}{TestLength}$$

$$8\text{-}HOOR\text{ }TEST\text{ }NPCR = 0.006 \text{ psi} / \text{ hour}$$

$$Test\text{ }Gradient = 0.756 \text{ psi/ft to } 9\text{-}5/8'' \text{ production casing shoe @ } 1586'$$

$$P_{End} = P_{EndTestWell} - P_{EndRefWell}$$

$$P_{End} = 614.884 \text{ psig} - 387.213 \text{ psig}$$

$$P_{End} = 227.671 \text{ psi}$$

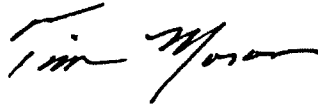
$$NPCR = \frac{(227.718 \text{ psi} - 227.671 \text{ psi})}{8 \text{ hours}}$$

Note: Test gradient calculations assume diesel specific gravity = 0.85.

Both Saltville Brine Wells CH-13B and CH-14A have met the EPA criteria for a successful mechanical integrity test for Class III salt solution mining injection wells, i.e. the calculated NPCR for an 8-hour test is less than 0.05 psi/hr. Also, test results indicated NPCR's of less than 0.020 psi/hr for the 2-hour test intervals for each well. (See attached Test Sheets.)

If you have any questions regarding the processed MIT data for these wells, please call or e-mail me.

Sincerely,



Tim Moran  
Manager of Engineer

Attachments

CC: PB ESS File w/attachments

### Mechanical Integrity Test Sheet

Date	March 3, 2006
Location	Virginia Gas/Duke Energy - Saltville, Va.
Well	Brine Well CH-13B
Comments:	MIT using EPA Water/Brine Interface Method - Modified for Diesel/Brine Interface

Test Well			Reference Well	
9-5/8"x4-1/2" Annulus (Diesel)			4-1/2" Tubing (Brine)	
Time	Pressure		Time	Pressure
0:01	617.88		0:01	375.712
1:01	617.764		1:01	375.598
2:01	617.709		2:01	375.538
3:01	617.661		3:01	375.49
4:01	617.622		4:01	375.447
5:01	617.604		5:01	375.387
6:01	617.555		6:01	375.34
7:01	617.514		7:01	375.293
8:01	617.435		8:01	375.241

TEST PERIOD		2-HOUR NPCR
Test Period 1		-0.001
Test Period 2		-0.002
Test Period 3		-0.020
Test Period 4		0.011
		8-HOUR NPCR
8 Hour Test		-0.003



#### Signatures

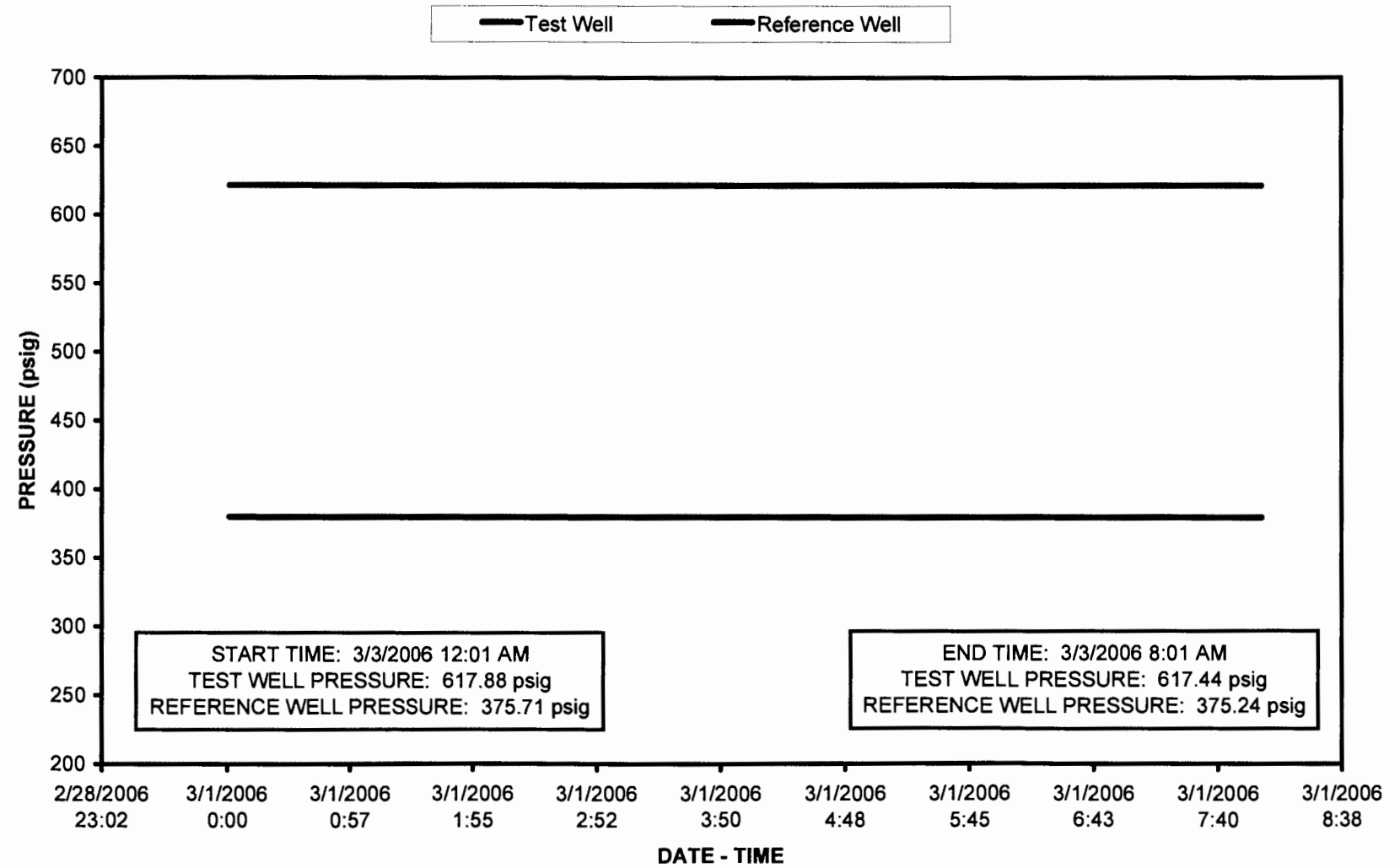
PB ESS Approval

*Tim Mason*

Operator Approval

*Jerdy L. [Signature]*


# MIT SALTVILLE BRINE WELL CH-13B



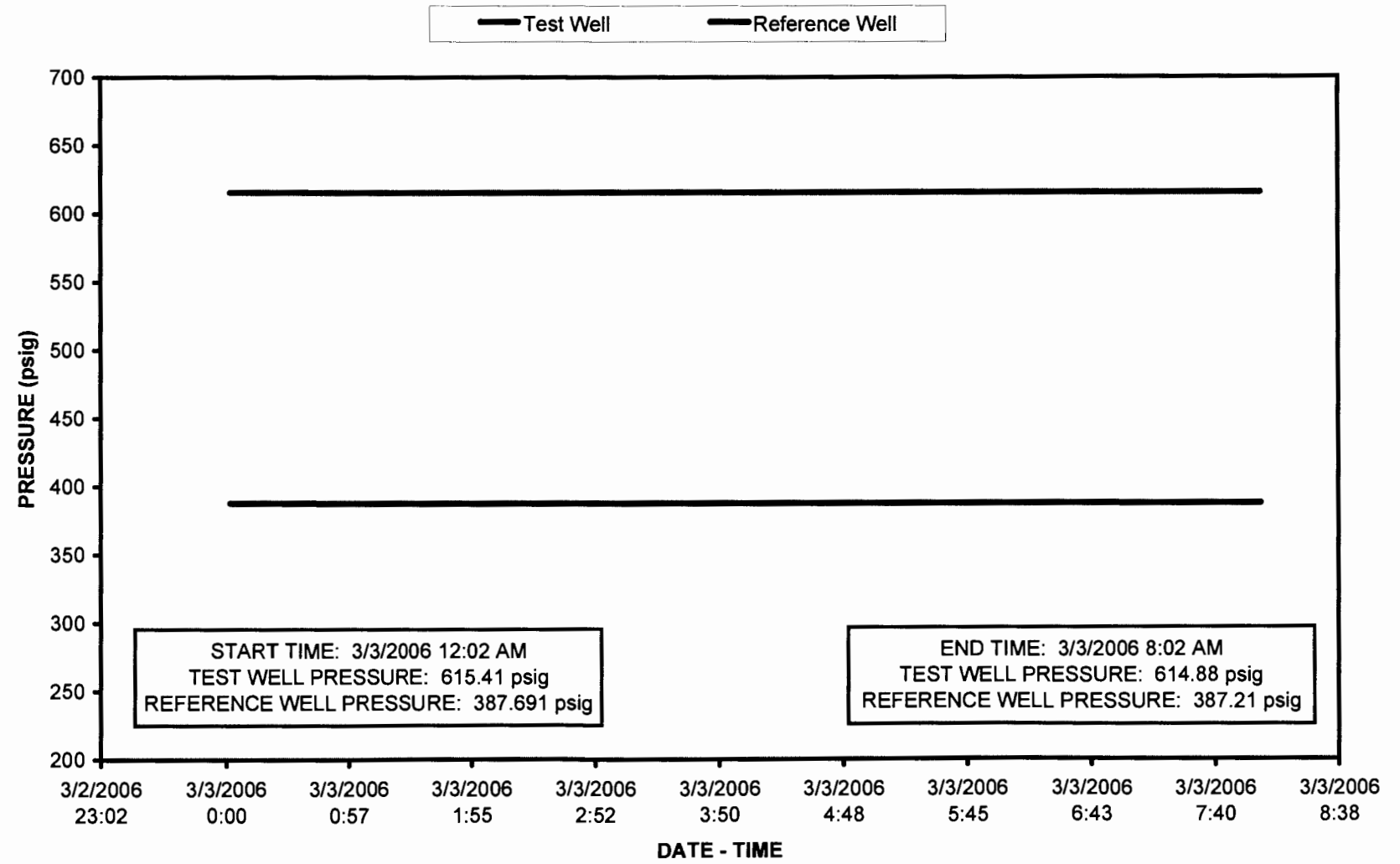
Mechanical Integrity Test Sheet	
Date	March 3, 2006
Location	Virginia Gas/Duke Energy - Saltville, Va.
Well	Brine Well CH-14A
Comments:	MIT using EPA Water/Brine Interface Method - Modified for Diesel/Brine Interface


Test Well		Reference Well	
9-5/8"x4-1/2" Annulus (Diesel)		4-1/2" Tubing (Brine)	
Time	Pressure	Time	Pressure
0:02	615.408	0:02	387.69
1:02	615.265	1:02	387.553
2:02	615.175	2:02	387.488
3:02	615.154	3:02	387.446
4:02	615.09	4:02	387.399
5:02	615.058	5:02	387.358
6:02	614.966	6:02	387.297
7:02	614.934	7:02	387.266
8:02	614.884	8:02	387.213

TEST PERIOD	2-HOUR NPCR
Test Period 1	0.016
Test Period 2	-0.002
Test Period 3	0.011
Test Period 4	-0.001
	8-HOUR NPCR
8 Hour Test	0.006

 <b>PB Energy Storage Services, Inc.</b> <small>ENGINEERING · CONSTRUCTION · OPERATIONS · MAINTENANCE</small>	Signatures	
	PB ESS Approval	<i>[Signature]</i>
	Operator Approval	<i>[Signature]</i>

# MIT SALTVILLE BRINE WELL CH-14A



 <b>PB Energy Storage Services, Inc.</b> <small>ENGINEERING - CONSTRUCTION - OPERATIONS - MAINTENANCE</small>	SPECIFICATION		Number 50665B	
	<b>MECHANICAL INTEGRITY TEST PROCEDURE FOR CLASS III SALT SOLUTION MINING WELLS USING MODIFIED EPA INTERFACE METHOD</b>		Date 2/2/06	
			Page 1 of 3	

**1.0 INTRODUCTION**

This program presents the proposed steps for completing a modified water/brine interface EPA approved Mechanical Integrity Test (MIT) for the Duke Energy Gas Transmission (DEGT)/Virginia Gas Company brine wells CH-13B and 14A. These steps are intended as a guideline for the MIT. Actual conditions encountered during the work will dictate the appropriate action to be taken. Any significant deviation from the proposed program will require prior approval by DEGT and PB ESS.

The purpose of the Mechanical Integrity Test (MIT) procedure is to test the mechanical integrity of the underground storage cavern to determine the suitability for leaching operations. In summary, the test procedure consists of the following basic steps: Fill the cavern with brine and pressure up to approximately 275 psi, allow the cavern to stabilize; inject a volume of diesel blanket material in each well sufficient to place the diesel/brine interface in the borehole below the casing shoe but above the cavern roof, and record wellhead pressures for a given test period to evaluate the integrity of the wells. (See attached well schematics.)

Reference 40 CFR Part 146, Water Brine Interface Mechanical Integrity Test for Class III Salt Solution Mining Injection Wells. The EPA procedure was modified to better represent the operating conditions with a diesel blanket at the roof of the cavern.

**2.0 PREPARATION**

2.1 Provide a connection to allow for the injection of brine through the 4-1/2" wash string.

2.2 Install pressure-monitoring equipment on well connections to allow continuous monitoring of diesel and brine wellhead pressures.

NOTE: Digital pressure recorders and a deadweight tester (digital or standard) utilized for the mechanical integrity test shall be calibrated in accordance with manufacturer specifications and traceable to National Bureau of Standard.

2.3 Provide a top connection on the wellhead (2" I.D. minimum) to permit installing a wireline lubricator for well logging, if required.

2.4 Provide a connection to allow for the injection of diesel blanket material.

2.5 Pre-pressure the cavern by injecting brine into the 4-1/2" hanging string of one well. Monitor pressures at both wells and measure and record the volume of brine injected and specific gravity of brine samples injected. Pressurize the cavern to approximately 375 psig. Allow the cavern to stabilize. See attached Well MIT data sheets for estimated brine test pressures.

2.6 Fill a frac tank with diesel and rig up a pump truck with meter to inject diesel into one well. Inject the required volume of diesel to fill the 9-5/8" x 4-1/2" annulus to the casing shoe. Inject an additional volume of diesel to place the interface in the borehole below the casing shoe. (See attached MIT Well Schematics Wells CH-13B and 14A for diesel volumes.) This volume should place the diesel/brine interface approximately 40' below the casing shoe in the borehole annulus. Injection rates should be kept to a minimum to prevent mixing of wellbore fluids. Injected volume to be metered or determined by tank

PREPARED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE	REVISION	DATE
Tim Moran	2/2/06	Frank Jurica	2/2/06	Roger Blair	2/2/06	2	2/20/06



## SPECIFICATION

Number 50665B

### MECHANICAL INTEGRITY TEST PROCEDURE FOR CLASS III SALT SOLUTION MINING WELLS USING MODIFIED EPA INTERFACE METHOD

Date 2/2/06

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volume. Diesel test pressure must be greater than the normal operating pressure of the diesel blanket during leaching. Repeat diesel injection for the second well.

- 2.7 Measure and record the volume of diesel injected and the wellhead pressures at 5-minute intervals.
- 2.8 Wait a minimum of 36 hours for temperature stabilization before initializing the test. Wellhead pressures and surface temperatures should be continuously monitored during the stabilization period. Digital recording equipment to collect pressure samples on 5-minute intervals.

### 3.0 TEST PERIOD

- 3.1 Monitor the wellhead pressures for the test well (9-5/8" X 4-1/2" annulus) and the reference well (4-1/2" casing) continuously during the test period for each well. Digital recording equipment to collect pressure samples on 5-minute intervals.
- 3.2 Report and record wellhead pressures each hour for an 8-hour test period after the temperature stabilization period.
- 3.3 Calculate the net pressure change for each hour interval using the following equations:

#### INITIAL TEST PRESSURE CALCULATION

$$P_{Initial} = P_{StartTestWell} - P_{StartReferenceWell}$$

#### FINAL TEST PRESSURE CALCULATION

$$P_{Final} = P_{EndTestWell} - P_{EndReferenceWell}$$

#### NET PRESSURE CHANGE RATE CALCULATION

$$NPCR = \frac{(P_{Initial} - P_{Final})}{TestLength}$$

Calculate the pressure change for each hourly test period and for the entire 8-hour test period.

- 3.4 Well has demonstrated mechanical integrity if the Net Pressure Change Rate (NPCR) is less than 0.05 psi/hr. Present the data in a standard format.
- 3.6 Determine the duration of the test using the appropriate test data and calculations.

### 4.0 TEST INITIALIZATION

- 4.1 Record the test and reference wellhead pressures with a digital pressure recorder at the start of the test. Digital pressure recorder to sample the wellhead pressures in 5-minute intervals.
- 4.2 Calculate the NPCR for the last test interval to determine if the test period should begin.

PREPARED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE	REVISION	DATE
Tim Moran	2/2/06	Frank Jurica	2/2/06	Roger Blair	2/2/06	2	2/20/06



## SPECIFICATION

Number 50665B

MECHANICAL INTEGRITY TEST  
PROCEDURE FOR CLASS III SALT  
SOLUTION MINING WELLS USING  
MODIFIED EPA INTERFACE METHOD

Date 2/2/06

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**5.0 TEST FINALIZATION**

- 5.1 Record the test and reference wellhead pressures with a digital pressure recorder at the end of the test period.
- 5.2 Calculate the NPCR for each test interval and the test period.

**6.0 REPORT ON TEST RESULTS**

- 6.1 Prepare a written report presenting test procedures, results and conclusions, along with a chronology of test activity, wellhead pressure records, and supporting calculations.

PREPARED BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE	REVISION	DATE
Tim Moran	2/2/06	Frank Jurica	2/2/06	Roger Blair	2/2/06	2	2/20/06

# M.I.T. WELL DATA SHEET

Rev. 2

## 1.0 WELL DESCRIPTION

1.1 Well Name	WELL #14A	
1.2 Operator	Virginia Gas	
1.3 Location	Field	Saltville
	County	Smyth
	State	Virginia
1.4 Cemented Production Casing	Size O.D.	9.625 inches
	Size I.D.	8.921 inches
	Depth	1586 feet
	Weight	36.00 lbs/ft
1.5 Brine Casing	Size	4.5 inches
	Depth	1780 feet
	Weight	11.6 lbs/ft
1.6 Total Depth	1786 feet	

## 2.0 TEST PRESSURES

2.1 Casing Seat Depth	1586 feet
2.2 Test Gradient	0.75 psi/ft
2.3 Brine Specific Gravity (Assumed)	1.20
2.4 Product Specific Gravity (Diesel)	0.85
2.5 Product Temperature	70 deg F
2.6 Interface Elevation	1626 feet
2.7 Casing Shoe Pressure	1190 psi
2.8 Surface Brine Pressure	359 psi
2.9 Surface Product Pressure	605 psi

## 3.0 VOLUME ESTIMATE

3.1 Total Volume To Casing Shoe	91 Bbls.
3.2 Volume From Casing Shoe to Interface	5 Bbls.
3.3 Total Product Required	96 Bbls.

## 4.0 COMPRESSIBILITY RESPONSE

4.1 Cavern Volume (estimate)	2,200,000 bbls
4.2 Displacement To Interface (Total 13B + 14A)	191 bbls
4.3 Cavern Compressibility	6.67 bbls/psi
4.4 Cavern Pressure Increase Due To Product Injection	14 psi
4.5 Cavern Pressure With Brine	345 psi
4.6 Brine Volume (estimate)	2300 bbls

# M.I.T. WELL DATA SHEET

Rev. 2

## 1.0 WELL DESCRIPTION

1.1 Well Name	WELL #13B	
1.2 Operator	Virginia Gas	
1.3 Location	Field	Saltville
	County	Smyth
	State	Virginia
1.4 Cemented Production Casing	Size O.D.	9.625 inches
	Size I.D.	8.921 inches
	Depth	1621 feet
	Weight	36.00 lbs/ft
1.5 Brine Casing	Size	4.5 inches
	Depth	1765 feet
	Weight	11.6 lbs/ft
1.6 Total Depth	1773 feet	

## 2.0 TEST PRESSURES

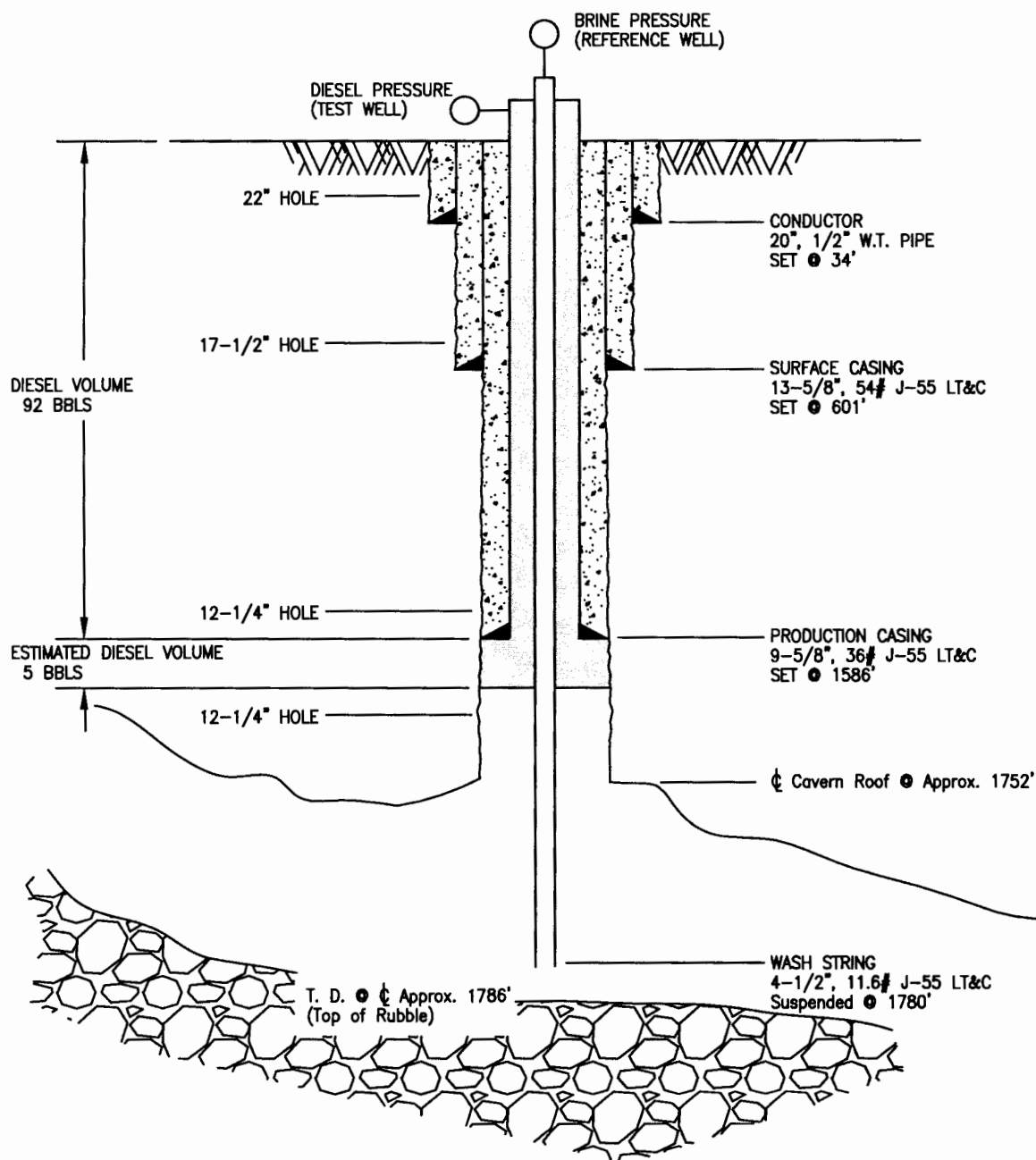
2.1 Casing Seat Depth	1621 feet
2.2 Test Gradient	0.75 psi/ft
2.3 Brine Specific Gravity (Assumed)	1.20
2.4 Product Specific Gravity (Diesel)	0.85
2.5 Product Temperature	70 deg F
2.6 Interface Elevation	1661 feet
2.7 Casing Shoe Pressure	1208 psi
2.8 Surface Brine Pressure	359 psi
2.9 Surface Product Pressure	611 psi

## 3.0 VOLUME ESTIMATE

3.1 Total Volume To Casing Shoe	93 Bbls.
3.2 Volume From Casing Shoe to Interface	2 Bbls.
3.3 Total Product Required	95 Bbls.

## 4.0 COMPRESSIBILITY RESPONSE

4.1 Cavern Volume (estimate)	2,200,000 bbls
4.2 Displacement To Interface	95 bbls
4.3 Cavern Compressibility	6.67 bbls/psi
4.4 Cavern Pressure Increase Due To Product Injection (See 14A)	psi
4.5 Cavern Pressure With Brine (See 14A)	psi
4.6 Brine Volume (estimate See 14A)	0 bbls



Notes:

1. All depths measured from BHF.
2. Reference PB ESS daily drilling reports.

PB Energy Storage Services, Inc.

Engineering Construction Operations  
11757 KATY FREEWAY #600  
HOUSTON, TEXAS 77079

DUKE ENERGY GAS TRANSMISSION  
VIRGINIA GAS COMPANY  
SALTVILLE, VIRGINIA

SALTVILLE WELL CH-14A  
MIT WELL SCHEMATIC

JOB No.  
50665B

DESIGN: TM

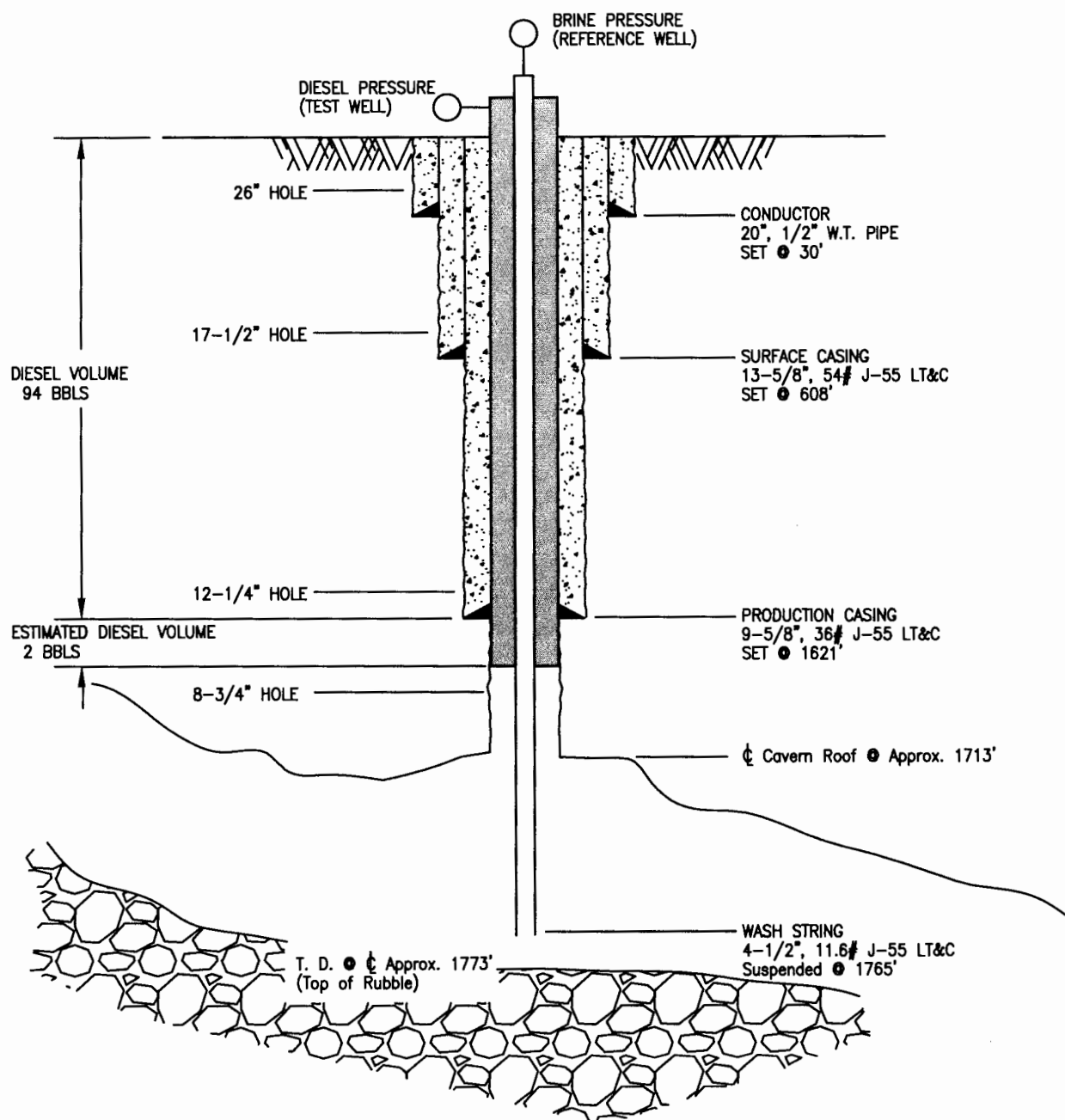
DRAWN: TJ

CHECKED: TM

DATE: 1/06

SCALE: NONE

DRAWING No.  
50665B-LC-002



**Notes:**

1. All depths measured from BHF.
2. Reference PB ESS daily drilling reports.

**PB Energy Storage Services, Inc.**

Engineering Construction Operations  
11757 KATY FREEWAY #600  
HOUSTON, TEXAS 77079

**DUKE ENERGY GAS TRANSMISSION**  
**VIRGINIA GAS COMPANY**  
**SALTVILLE, VIRGINIA**

**SALTVILLE WELL CH-13B**  
**MIT WELL SCHEMATIC**

**JOB No.**  
**50665B**

**DESIGN:** TM

**DRAWN:** TJ

**CHECKED:** TM

**DATE:** 2/06

**SCALE:** NONE

**DRAWING No.**  
**50665B-LC-004**

Saltville Gas Storage, LLC  
Brine Supply Project  
Drilling & Completion of Two Brine Wells (CH-14A/CH-13B)

OPEN-HOLE LOGGING NARRATIVE

CH-14A (Logs included)

- *Surface Hole* (0 to 588'): **Array Induction/Gamma Ray/Caliper Log** (Service Date - 12/12/05)
  1. Resistivity: No readings below 2 ohm – Indicates dry hole. A water source was never encountered while drilling.
  2. Caliper: Hole size varied from 17 ½" (bit size) to over 20" with irregularities over crevices intervals (100 to 400 feet).
- *Production Hole* (624' to 1580'): **Laterlog/Gamma Ray Log** (Service Date – 12/20/05)
  1. Resistivity: One spike reading below 2 ohm at 710' due to a shale streak containing bound water. The rest of the hole has readings above the accepted limit of 2ohm indicating a dry hole. A water source was never encountered while drilling.

**4-Arm Caliper Log** (Service Date - 12/20/05)

  1. Caliper: Hole size varied from 12 ¼" (bit size) to approximately 12 ¾". Limited irregularities were present.

CH-13B (Log included)

- *Surface Hole* (0 to 625'): Only two service companies, Schlumberger, Inc. and Allegheny Logging, performed open-hole logs in the Eastern United States while the wells were being drilled. We were unable to get a logging truck within 4 days so the EPA was contacted on January 31, 2006 to discuss the problem. Permission was granted to skip logging operations since: A) water had not been encountered while drilling and B) hole caving problems could be experienced due to crevices, etc. during extensive standby time which could result in abandonment of the well.
- *Production Hole* (615' to 1658'): **Array Induction/Gamma Ray/Caliper Log** (Service Date - 2/6/06)
  1. Resistivity: No readings below 2 ohm – Indicates a dry hole. A water source was never encountered while drilling.
  2. Caliper: Hole size varied from the bit size of 12 1/4" with average readings below 12 ½'.

Saltville Gas Storage, LLC  
Brine Supply Project  
Drilling & Completion of Two Brine Wells (CH-14A/CH-13B)

## CEMENT OPERATIONS NARRATIVE

### **Cement Rational, Calculations and Logging**

#### CH-14A

**Surface Casing:** 13 3/8" / 54# / J-55 / LT&C

Ran 601 feet

Bit size - 17 1/2"

Crevice(s) were encountered in several portions of the upper hole (~100 to 400') that resulted in lost circulation of the drilling medium (air). In this situation it is impossible to calculate the amount of cement needed to fill the casing annulus. A decision was made to calculate the cement volume needed in normal conditions, add excess to potentially fill the crevice(s), and tail in with standard concrete to fill any remaining void. Although water was not encountered during drilling, cementing the surface string from TD to surface would guarantee isolation of any potential aquifer while completely stabilizing the casing for operations.

Calculation:

Annular Volume:  $(.6946 \text{ cuft/ft})(601 \text{ ft}) = 418 \text{ cuft}$

600 sacks of neat cement were used. Equal to 126 bbl (or 707cuft) of cement slurry.

$707 - 418 = 289 \text{ cuft}$  above calculated volume or  $(289/418) = 70\%$  excess

Results: (Schlumberger service date: 12/16/05)

Cement did not return to surface. A cement bond log ran by Timco, Inc on 12/17/05 indicated the cement top was at 345'. Although water was not:

- encountered during drilling or
- indicated on the resistivity log

it was decided to concrete from 345' to surface with 8 cubic yards. This work was performed on 12/19/05 by Lakeside Ready Mix, Inc. resulting in cement to surface.

## CH-14A (continued)

### **Production Casing:** 9 5/8" / 36# / J-55 / LT&C

Ran 1,586 feet

Bit size – 12 1/4"

Crevices were not encountered in the lower hole. For this reason, our experience in Saltville's previous well conversion project was used in cementing the production string. This involved calculating the annular volume and adding greater than 30% excess.

#### Calculations:

Annular Volume:  $(.3132 \text{ cuft/ft})(1586 \text{ ft}) = 497 \text{ cuft}$

412 sacks of salt saturated cement were used. Equal to 127 bbl (or 709 cuft) of slurry.

$709 - 497 = 212 \text{ cuft}$  above calculated volume or  $(212/497) = 42\%$  excess

Results: (Schlumberger service date: 12/21/05)

Cement did return to surface. A cement bond log ran on 12/29/05 by Baker Atlas (attached) confirmed the same. A successful pressure test of 500# was also applied below the guide shoe prior to drilling out. This provided an additional method to verify cement integrity

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## CH-13B

### **Surface Casing:** 13 3/8" / 54# / J-55 / LT&C

Ran 608 feet

Bit size - 17 1/2"

Crevise problems in CH-13B were similar to those in CH-14A. CH-14A rationale was used here since it was successful in isolating and protecting potential aquifers. (Calculate annular cement volume, add excess, and fill the remainder with concrete.)

#### Calculation:

Annular Volume:  $(.6946 \text{ cuft/ft})(608 \text{ ft}) = 422 \text{ cuft}$  Since results of a 600 sack cement job were unsuccessful on CH-14A due to the presence of crevices, it was decided to cut back on cement. Therefore, 500 sacks of neat cement were used. Equal to 109 bbl or 612 cuft of cement slurry.

$612 - 422 = 190 \text{ cuft}$  above calculated volume or  $(190/422) = 45\%$  excess

CH-13B (continued)

Results: (Schlumberger service date: 2/2/06)

Cement did not return to surface. A cement bond log ran on 12/17/05 by Allegheny Wireline Services, Inc. indicated the cement top to be at 325'. Although water was not:

- encountered during drilling or
- indicated on the resistivity log

it was decided to concrete from 325' to surface with 8 cubic yards. This work was performed on 2/3/06 by Lakeside Ready Mix, Inc. resulting in cement fill to surface.

**Production Casing:** 9 5/8" / 36# / J-55 / LT&C

Ran 1,621 feet

Bit size – 12 1/4" / Caliper hole size – ave. 12 3/8" / Smooth hole

Crevice were not encountered in the lower hole. Experience dictated utilizing the same rational used on CH-14A to calculate cement volume.

Calculation:

Annular Volume:  $(.3132 \text{ cuft/ft})(1621 \text{ ft}) = 508 \text{ cuft}$

412 sacks of salt saturated cement were used. Equal to 127 bbl (or 709cuft) of slurry.

$709 - 508 = 201 \text{ cuft excess}$  or  $(201/508) = 40\% \text{ excess}$

Results:

Cement did return to surface. The cement bond log ran on 12/29/05 by Baker Atlas confirmed cement from casing TD to surface. A successful pressure test of 500# was performed below the guide shoe prior to drilling out. This provided an additional method to verify cement integrity.

## Service Contract Receipt

**Schlumberger**

## SCHLUMBERGER TECHNOLOGY CORPORATION

Job Number

2200555202

LEFT DISTRICT	Date	12/16/2005	Time	8:00:00 AM
ARRIVE LOCATION	Date	12/16/2005	Time	12:00:00 PM
JOB START	Date	12/16/2005	Time	1:30:00 PM
JOB COMPLETION	Date	12/16/2005	Time	2:55:00 PM
LEAVE LOCATION	Date	12/16/2005	Time	3:15:00 PM
ARRIVED DISTRICT	Date	12/16/2005	Time	7:45:00 PM

## Invoice Mailing Address:

Duke Energy

Saltville, Va

## Service Instructions

CEMENT 13 3/8" CASING PER CUSTOMER REQUEST:  
 TAIL: 300 SKS CLASS A NEAT  
 SIDE: 550 LBS S001

## Service Description

Cementing - Cem Surface Casing

Customer PO	Contract	AFE	Rig
Well	State/Province	County/Parish/Block	Legal Location
CH-14 A CH-14 A	VA	ANDERSON	
Field	Customer or Authorized Representative		
	McHenry, Eddie		

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Amount
<b>Services</b>					
102871025	Casing Cmnt 2001-2500' 1st 4hr	1	EA	3,515.00	3,515.00
48601000	Low Pressure Cement Plug Container	1	JOB	863.00	863.00
49100000	Service Chg Cement Matl Land All DW Fur	300	CF	3.76	1,128.00
49102000	Transportation Cement Ton Mile	1438	MI	2.77	3,983.26
59200002	Mileage, All Other Equipment	200	MI	7.39	1,478.00
59697004	PRISM	1	JOB	1,450.00	1,450.00
<b>Services Subtotal:</b>					<b>12,417.26</b>
<b>Products</b>					
102946000	Fuel Surcharge	1	EA	206.84	206.84
D130	Polyester Flake D130	38	LB	7.45	283.10
D901	Cement, Class A D901	301	CF	25.95	7,810.95
S001	Calcium Chloride 77% S1	564	LB	1.18	665.52
<b>Products Subtotal:</b>					<b>8,966.41</b>
<b>Miscellaneous</b>					
107264001	DOT Vehicle Charge, per each	2	EA	150.00	300.00
<b>Miscellaneous Subtotal:</b>					<b>300.00</b>
<b>Estimated Total (USD):</b>					<b>21,683.67</b>

## Service Contract Receipt

Schlumberger

SCHLUMBERGER TECHNOLOGY CORPORATION

SC Number  
2200555220

LEFT DISTRICT	Date	12/21/2005	Time	3:30:00 PM
ARRIVE LOCATION	Date	12/21/2005	Time	8:00:00 PM
JOB START	Date	12/22/2005	Time	3:00:00 AM
JOB COMPLETION	Date	12/22/2005	Time	4:05:00 AM
LEAVE LOCATION	Date	12/22/2005	Time	4:55:00 AM
ARRIVED DISTRICT	Date	12/22/2005	Time	8:30:00 AM

Invoice Mailing Address:  
Duke Energy

Salville, Va

## Service Instructions

CEMENT 9 5/8" CASING PER CUSTOMER REQUEST:

412 SKS CLASS A+ 35% D044+ 10% D053+ 0.2% D046+ 0.5%  
D065

1.72 yield

## Service Description

Cementing - Cem Surface Casing

Customer PO	Contract	A/E	Rig
Well	State/Province	County/Parish/Block	Legal Location
CH-14-A, CH-14-A	TN	ANDERSON	
Field	Customer or Authorized Representative		
	Hill, Scott		

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Disc	Amount
<b>Services</b>						
102871020	Casing Cmnt 0000-2000' 1st 4hr	1	EA	3,730.00	0.0%	3,730.00
48019000	Cement Bulk Unit hrs On Location	10	HR	201.50	0.0%	2,015.00
48020000	Cement Pump-add. hr On Locat	5	HR	1,000.00	0.0%	5,000.00
48601000	Low Pressure Cement Plug Container	1	JOB	967.00	0.0%	967.00
49100000	Service Chg Cement Matl Land All DW Fur	605	CF	4.22	0.0%	2,553.10
49102000	Transportation Cement Ton Mile	2638	MI	3.11	0.0%	8,204.18
59200002	Mileage, All Other Equipment	200	MI	8.28	0.0%	1,656.00
59697004	PRISM	1	JOB	1,630.00	0.0%	1,630.00
Services Subtotal:						25,755.28
Discount:						0.00
Estimated Total (USD):						25,755.28
<b>Products</b>						
102946000	Fuel Surcharge	1	EA	515.11	0.0%	515.11
56702095	Plug, Cementing 9 5/8 In Top Plastic	1	EA	453.50	0.0%	453.50
D044	Salt, Granulated D44	9381	LB	0.59	0.0%	5,534.79
D046	Antifoam Agent, All Purpose D46	78	LB	9.60	0.0%	748.80
D053	Cement Agent D53	3873	LB	1.29	0.0%	4,996.17
D065	Dispersant, TIC D65	194	LB	14.85	0.0%	2,880.90
D901	Cement, Class A D901	412	CF	31.15	0.0%	12,833.80
Products Subtotal:						27,963.07
Discount:						0.00
Estimated Total (USD):						27,963.07
<b>Miscellaneous</b>						
107264001	DOT Vehicle Charge, per each	2	EA	125.00	0.0%	250.00
Miscellaneous Subtotal:						250.00
Discount:						0.00
Estimated Total (USD):						250.00

# Service Contract Receipt

# Schlumberger

SCHLUMBERGER TECHNOLOGY CORPORATION

SC Number  
2200555220

LEFT DISTRICT	Date	12/21/2005	Time	3:30:00 PM
ARRIVE LOCATION	Date	12/21/2005	Time	8:00:00 PM
JOB START	Date	12/22/2005	Time	3:00:00 AM
JOB COMPLETION	Date	12/22/2005	Time	4:05:00 AM
LEAVE LOCATION	Date	12/22/2005	Time	4:55:00 AM
ARRIVED DISTRICT	Date	12/22/2005	Time	8:30:00 AM

Service Instructions  
CEMENT 9 5/8" CASING PER CUSTOMER REQUEST:  
  
412 SKS CLASS A+ 35% D044+ 10% D053+ 0.2% D046+ 0.5% D065

Service Description  
Cementing - Cem Surface Casing

Invoice Mailing Address:  
Duke Energy

Saltville, Va

Customer PO	Contract	AFE	Rig
Well CH-14 A CH-14 A	State/Province TN	County/Parish/Block ANDERSON	Legal Location
Field	Customer or Authorized Representative Hill, Scott		

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Disc	Amount
Total (Before Discount):		53,968.35				
Discount:		0.00				
Special Discount:				Estimated Discounted Total (USD):		53,968.35

THE ESTIMATED CHARGES AND DATA SHOWN ABOVE ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

THE SERVICES, EQUIPMENT, MATERIALS AND /OR PRODUCTS PROVIDED BY THIS SERVICE CONTRACT RECEIPT HAVE BEEN PERFORMED OR RECEIVED AS SET FORTH ABOVE.

Signature of Customer or Authorized Representative:

  
Thu Dec 22 04:56:56 2005  
Hill, Scott

Signature of Schlumberger Representative:

  
Thu Dec 22 04:50:22 2005  
Compton, Thomas



RECEIVED

028878



PHONE: (276) 628-4948

P.O. Box 1144 Abingdon, VA 24212

FAX: (276) 628-2245

## GENERAL TERMS AND CONDITIONS

Unloading time 1 hour per 10 cubic yards. All excess waiting time will be charged at the rate of \$60.00 per hour.  
There will be a minimum charge of \$60.00 per hour or fraction thereof for each hour or part of an hour that the truck is held after the first 60 minutes.

TIME IN: \_\_\_\_\_ TIME OUT: \_\_\_\_\_ WAITING TIME: \_\_\_\_\_ CYLINDERS TAKEN: \_\_\_\_\_

## Purchaser: Note - Important Information

- This load of concrete is produced in accordance with standard Specifications for Ready Mixed Concrete, A.S.T.M. Designation C-94-81 and the quality is guaranteed to be as indicated on this ticket with tested in accordance with these specifications.
- WE DO NOT GUARANTEE FINISHED RESULTS obtained from this load of concrete, as many important factors affecting the ultimate quality of the completed job are out of our control.
- DELIVERIES MADE ON PRIVATE PREMISES ONLY AT PURCHASER'S RISK. We will not assume responsibility for any damage caused by our trucks when required to make delivery anywhere off a paved public street or roadway.
- Any claim of the purchase must be made in writing within 48 hours from the time of delivery.

Drivers are not permitted to add water to the mix to exceed the maximum slump. Additional water added to this concrete will reduce its strength. Any water added is at Customer's risk.

WATER ADDED ON JOB 50 gals.  
I AGREE TO THE TERMS AND CONDITIONS OF THIS DELIVERY:

CUSTOMER'S REPRESENTATIVE

A 1 1/2% per month (18% Annual Percentage Rate) finance charge will be added to unpaid balance after 30 days. If not paid in 60 days your account will be turned over to a collection agency.

## FAILURE TO MAKE A PAYMENT IS A DEFAULT DELINQUENCY AND DEFAULT

I agree to pay the costs incurred to collect this bill in the event of my default in payment, including reasonable attorney's fees.

## CAUTION

Freshly mixed cement, mortar, grout, or concrete can cause skin irritation. Avoid direct contact where possible and wash affected areas promptly with water. If any contaminated material gets into the eyes, rinse immediately and repeatedly with water and get prompt medical attention.

SEE MSDS INFO ON REVERSE SIDE

CUSTOMER ID 898	P.O. NUMBER	JOB NUMBER	TIME 1:26PM	DATE 19Dec05	TICKET 28878		
SOLD TO			DELIVER TO				
Wayne Jones Const.			Truck #: 11				
Va. Gas Saltville Va.			Driver: Ralph				
QUANTITY THIS LOAD	QUANTITY ORDERED	QUANTITY DELIVERED	PRODUCT CODE	PRODUCT DESCRIPTION	UNIT OF MEASURE	UNIT PRICE	EXTENDED PRICE
8.00	8.00	8.00	3000 Mfg	3000psi w/Mfg Sand	yd3	74.35	
			Hot Water	Hot Water			
			Fuel	Fuel Surcharge			
TRUCK	PLANT	SLUMP	DUE AT JOB	USE OF CONCRETE			
LEAVE PLANT	ARRIVE JOB	START DISCH.	FINISH DISCH.	ARRIVE AT PLANT	DRIVER		
SUB TOTAL							
TAX							
TOTAL							
GRAND TOTAL							

DELIVERY INSTRUCTIONS

SPECIAL INSTRUCTIONS

# Service Contract Receipt

# Schlumberger

SCHLUMBERGER TECHNOLOGY CORPORATION

Job Number

2200555202

LEFT DISTRICT	Date	12/16/2005	Time	8:00:00 AM
ARRIVE LOCATION	Date	12/16/2005	Time	12:00:00 PM
JOB START	Date	12/16/2005	Time	1:30:00 PM
JOB COMPLETION	Date	12/16/2005	Time	2:55:00 PM
LEAVE LOCATION	Date	12/16/2005	Time	3:15:00 PM
ARRIVED DISTRICT	Date	12/16/2005	Time	7:45:00 PM

Service Instructions  
CEMENT 13 3/8" CASING PER CUSTOMER REQUEST:  
TAIL: 300 SKS CLASS A NEAT  
SIDE: 550 LBS S001  
*300 SKS used from 12/11/05 TICKET.*

Service Description  
Cementing - Cem Surface Casing

Invoice Mailing Address:  
Duke Energy

Saltville, Va

Customer PO	Contract	AFE	Rig
Well CH-14 A CH-14 A	State/Province VA	County/Parish/Block ANDERSON	Legal Location
Field	Customer or Authorized Representative McHenry, Eddie		

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Amount
THE ESTIMATED CHARGES AND DATA SHOWN ABOVE ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.					
THE SERVICES, EQUIPMENT, MATERIALS AND /OR PRODUCTS PROVIDED BY THIS SERVICE CONTRACT RECEIPT HAVE BEEN PERFORMED OR RECEIVED AS SET FORTH ABOVE.					
Signature of Customer or Authorized Representative:		McHenry, Eddie		Date:	
Signature of Schlumberger Representative:		<i>Alan Comer</i>		Date:	12/16/05
		Comer, Alan			

*13 3/8 cement*

*JIB*

*CH-14 A*

## Service Contract Receipt

**Schlumberger**

SCHLUMBERGER TECHNOLOGY CORPORATION

SC Number  
2200555417

LEFT DISTRICT	Date	2/2/2006	Time	10:30:00 PM
ARRIVE LOCATION	Date	2/3/2006	Time	3:00:00 AM
JOB START	Date	2/3/2006	Time	4:53:00 AM
JOB COMPLETION	Date	2/3/2006	Time	5:55:00 AM
LEAVE LOCATION	Date	2/3/2006	Time	6:45:00 AM
ARRIVED DISTRICT	Date	2/3/2006	Time	11:30:00 AM

## Invoice Mailing Address:

DUKE ENERGY  
1096 OLE BERRY DRIVE  
ABINGDON  
, VA

## Service Instructions

CEMENT 13 3/8 CASING PER CUSTOMER REQUEST:

LEAD: 500 SKS CLASS A + 2% S001

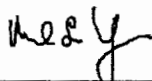
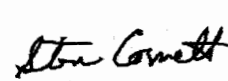
SIDE: 400 LBS D020

## Service Description

Cementing - Cem Surface Casing

Customer PO	Contract	AFE	Rig
			KEY RIG 1
Well	State/Province	County/Parish/Block	Legal Location
CH 13B 13			
Field	Customer or Authorized Representative		
	Haynes, Mike		

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Amount
THE ESTIMATED CHARGES AND DATA SHOWN ABOVE ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.					
THE SERVICES, EQUIPMENT, MATERIALS AND /OR PRODUCTS PROVIDED BY THIS SERVICE CONTRACT RECEIPT HAVE BEEN PERFORMED OR RECEIVED AS SET FORTH ABOVE.					
Signature of Customer or Authorized Representative:		Fri Feb 03 06:26:09 2006			
	Haynes, Mike				
Signature of Schlumberger Representative:		Fri Feb 03 06:15:44 2006			
	Cornett, Steve				

## Service Contract Receipt

**Schlumberger**

SCHLUMBERGER TECHNOLOGY CORPORATION

Job Number

2200555431

LEFT DISTRICT	Date	2/7/2006	Time	1:30:00 AM
ARRIVE LOCATION	Date	2/7/2006	Time	6:00:00 AM
JOB START	Date	2/7/2006	Time	7:00:00 AM
JOB COMPLETION	Date	2/7/2006	Time	8:30:00 AM
LEAVE LOCATION	Date	2/7/2006	Time	9:30:00 AM
ARRIVED DISTRICT	Date	2/7/2006	Time	4:00:00 PM

Invoice Mailing Address:  
DUKE ENERGY  
1096 OLE BERRY DRIVE  
ABINGDON  
, VA

Service Instructions

CEMENT 9 5/8 CASING PER CUSTOMER REQUEST:

LEAD: 412 SKS CLASS A + 35% D044 + 10% D053 + 0.2% D046 + 0.5% D065

SIDE: 1050 lbs D020

Service Description

Cementing - Cem Surface Casing

Customer PO	Contract	AFE	Rig
			KEY RIG 1
Well	State/Province	County/Parish/Block	Legal Location
CH 13B 13			
Field	Customer or Authorized Representative		
	Scott, Hill		

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Amount
<b>Services</b>					
102871020	Casing Cmmt 0000-2000' 1st 4hr	1	EA	3,325.00	3,325.00
48601000	Low Pressure Cement Plug Container	1	JOB	863.00	863.00
49100000	Service Chg Cement Matl Land All DW Fur	623	CF	3.76	2,342.48
49102000	Transportation Cement Ton Mile	2700	MI	2.77	7,479.00
59200002	Mileage, All Other Equipment	800	MI	7.39	5,912.00
59697004	CemCAT	1	JOB	1,450.00	1,450.00
Services Subtotal:					21,371.48
Discount:					11,113.17
Special Discount:					0.00
Estimated Total (USD):					10,258.31
<b>Products</b>					
102946000	Fuel Surcharge	1	EA	463.78	463.78
56702095	Plug, Cementing 9 5/8 In Top Plastic	1	EA	404.50	404.50
D020	Bentonite Extender D20 Gel mix	500	LB	0.58	290.00
D044	Salt, Granulated D44	10580	LB	0.52	5,501.60
D046	Antifoam Agent, All Purpose D46	80	LB	8.57	685.60
D053	Cement Agent D53	3880	LB	1.15	4,462.00
D065	Dispersant, TIC D65	200	LB	13.25	2,650.00
D901	Cement, Class A D901	412	CF	25.95	10,691.40
Products Subtotal:					25,148.88
Discount:					12,836.25
Special Discount:					0.00
Estimated Total (USD):					12,312.63
<b>Miscellaneous</b>					
107264001	DOT Vehicle Charge, per each	2	EA	150.00	300.00

# Service Contract Receipt

# Schlumberger

SCHLUMBERGER TECHNOLOGY CORPORATION

Job Number

2200555431

LEFT DISTRICT	Date	2/7/2006	Time	1:30:00 AM
ARRIVE LOCATION	Date	2/7/2006	Time	6:00:00 AM
JOB START	Date	2/7/2006	Time	7:00:00 AM
JOB COMPLETION	Date	2/7/2006	Time	8:30:00 AM
LEAVE LOCATION	Date	2/7/2006	Time	9:30:00 AM
ARRIVED DISTRICT	Date	2/7/2006	Time	4:00:00 PM

Invoice Mailing Address:  
DUKE ENERGY  
1096 OLE BERRY DRIVE  
ABINGDON  
VA

Service Instructions

CEMENT 9 5/8 CASING PER CUSTOMER REQUEST:

LEAD: 412 SKS CLASS A + 35% D044 + 10% D053 + 0.2%  
D046 + 0.5% D065

SIDE: 1050 lbs D020

Service Description

Cementing - Cem Surface Casing

Customer PO	Contract	AFE	Rig	KEY RIG 1
Well	CH 13B 13	State/Province	County/Parish/Block	Legal Location
Field	Customer or Authorized Representative Scott, Hill			

THE ESTIMATED CHARGES AND DATA SHOWN BELOW ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

Item	Description	Quantity	Unit	Unit Price	Amount
	Miscellaneous Subtotal:				300.00
	Discount:				0.00
	Special Discount:				0.00
	Estimated Total (USD):				300.00

Total (Before Discount):	46,820.36		
Discount:	23,949.42		
Special Discount:	0.00	Estimated Total (USD):	22,870.94

THE ESTIMATED CHARGES AND DATA SHOWN ABOVE ARE SUBJECT TO CORRECTION BY SCHLUMBERGER.

THE SERVICES, EQUIPMENT, MATERIALS AND /OR PRODUCTS PROVIDED BY THIS SERVICE CONTRACT RECEIPT HAVE BEEN PERFORMED OR RECEIVED AS SET FORTH ABOVE.

Signature of Customer or Authorized Representative:

Scott, Hill

Date:

Signature of Schlumberger Representative:

Sprouse, Denzil

Date: